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Structure of a breeding nest of the Daurian pika, *Ochotona daurica*, in Mongolia

Takeo KAWAMICHI[1] and Samdannyamin DAWANYAM[2]

[1] *Department of Biology, Osaka City University, Sugimoto, Sumiyoshi-ku, Osaka 558, Japan*
Fax. +81-75-551-3936, e-mail. pika@sci. osaka-cu. ac. jp
[2] *Rodent Research Section, Mongolian Plant Protection Institute, Ulanbator, Mongolia*

Abstract. We excavated a breeding nest of the Daurian pika, *Ochotona daurica*, in central Mongolia. Four young were captured within the burrows. Three food storage chambers contained plant fragments and a large amount of fecal matter, indicating that hoarded food had been consumed during the last winter. The nest chamber was spherical and measured 22×18×21 cm. Most of the nest chamber was filled with piles of grasses, and these piles were presumably their resting site. The burrow system had three entrances, and the nest chamber was connected to three burrows. Multiple nest entrances were provided ready access to refuge for pikas active on the ground surface from aerial and terrestrial predators, while multiple burrows also provide refuge against the intrusion of predators such as stoats into nest chambers.

Key words: Daurian pika, food storage, nest burrows, nests, *Ochotona daurica*.

The nest, or burrow system, has been described for four species of pikas in the genus *Ochotona*: *O. daurica* (Dmitriyev 1991), *O. rufescens* (Puget 1971), *O. pallasi* (Simirnov 1974), and *O. pusilla* (Simirnov 1974). Although Dmitriyev (1991) revealed the distribution of nest chambers in the complicated burrow systems of a colony of *O. daurica*, for none of these four species, have the detailed structure of nest chambers, or breeding nests, been described.

The Daurian pika, *O. daurica*, occurs commonly throughout grasslands or steppes in the south-eastern corner of west Siberia in Russia, the northern half of Mongolia, and northern China (Ognev 1940). Despite their extensive range, little information on their natural history has been gathered, other than details of their reproduction, vocalization, and of the hay piles accumulated at their nest entrances (Loukashkin 1940, Zevegmid 1975, Orr 1977, Dlamtcheren *et al.* 1989, Dmitriyev 1991).

The purpose of this paper, therefore, is to provide detailed information on the structure of a breeding nest of the Daurian pika, and to discuss the function of its complicated burrow system in steppe habitats.

Materials and Methods

The study area was in the grassland at Baan-tsagaan Som (Village) (45°50′

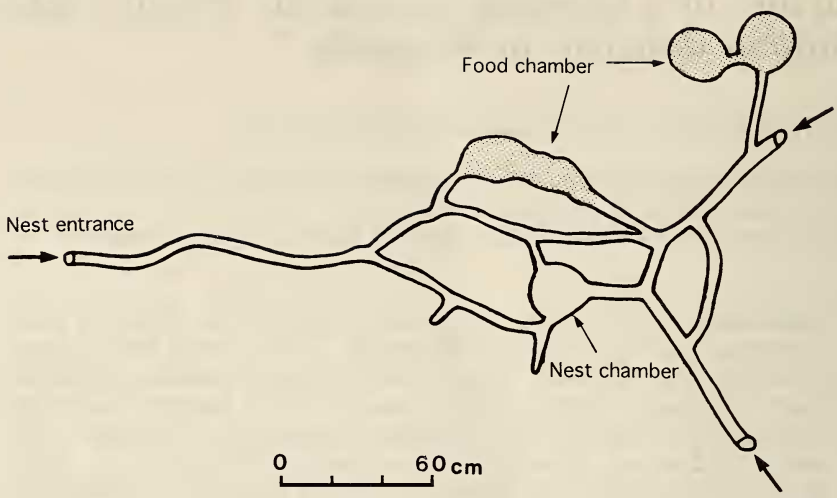

Fig. 1 Horizontal section of burrow system of *Ochotona daurica* consisting of one nest chamber, three vacant food chambers (hatched), and three nest entrances (large arrows).

N, 99°30′E), 126 km south-west of Bayan-hongor, Bayan-hongor Prefecture, central Mongolia.

We located one breeding nest of *O. daurica* after observing that young pikas repeatedly entered and left a burrow entrance on 14 July 1992. The burrow system was excavated carefully with a shovel, a knife, and by hands, and measured to the nearest centimeter. Three-dimensional measurements are given as: length×width×height.

Results

1. Burrow system

The burrow system had three entrances to the ground surface (Fig. 1). These entrances, measuring 5 cm in diameter, gave access to sloping burrows which were 5-7 cm in diameter. In vertical section, the burrows were round with flat bottoms, and extended to a depth of 20-38 cm. The distance from the left entrance to the two entrances on the right (Fig. 1) was 280 or 290 cm.

Three food storage chambers were detected. Two spherical chambers measured 21×21×18 cm and 22×22×20 cm, respectively. The ceilings of the two chambers were 20 and 21 cm below ground. The remaining chamber was 55 cm long and 17 cm wide at its widest point.

The three food storage chambers contained small quantities of plant fragments and a large amount of fecal matter which was not old, indicating that food had been hoarded and consumed during the winter of 1991-1992. Feces were only noticeable in these three food storage chambers and the corner of the nest chamber.

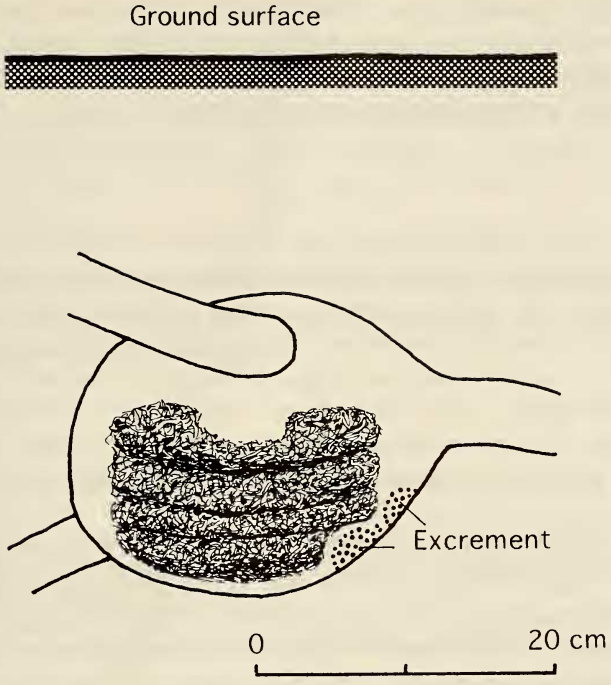

Fig. 2. The structure of a nest chamber. The nest chamber was linked to the surface by three burrows; 4-5 layers of dry grasses were accumulated, and two mounds of feces were at the bottom.

Prior to our excavation, an adult pika, presumably the mother, ran away from the burrow system. We were able to capture four young of similar sizes within the burrows (body weight 34.0±0.9 (*SE*) g; ear length 12.3±0.4 mm; hind foot length 22.5±0.5 mm; total length 106.5±2.3 mm, $n=4$). These observations indicated that this nest was being used for rearing young, and because of the large amount of feces found in the three chambers, we believe that this burrow system was in continuous use throughout the winter of 1991-1992 and the spring of 1992.

2. Nest chamber

The nest chamber was spherical and measured 22×18×21 cm. The ceiling of the nest chamber was 16 cm below ground. The nest chamber was connected to three burrows each running in a different direction (Fig. 1). There were two mounds of feces in the corner of the nest chamber.

Most of the nest chamber was filled with fibrous grasses as nesting material. These grasses, presumably the same as their food plants, included both leaves and roots. Most of these grasses were curled and intertwined, so that the piles formed a soft cushion. Piles of grasses (18×21×13 cm) were composed of four or five layers (Fig. 2). The top layer consisted of a 4 cm thick dried disk weighing 42 g. The central part was depressed, and was

presumably their resting site. The distance from the top layer to the chamber's ceiling was 8 cm. Lower layers were less dry, and indicated that *O. daurica* had repeatedly added fresh piles of nesting material on top of material which had lost its softness and/or become damp.

Discussion

Ochotona pikas exhibit three types of habitat preference. They either occupy rocks, steppes, or habitats intermediate between these two (Kawamichi 1971, Smith 1988). Of the four species whose nests or burrow systems have been described, *O. daurica* (Dmitriyev 1991) and *O. pusilla* (Simirnov 1974) are "steppe dwellers", and *O. rufescens* (Puget 1971) and *O. pallasi* (Simirnov 1974) are intermediate types. All four species have complex burrow systems with many entrances. Rock dwelling species inhabit rock slides, however their nests have not so far been described, because of the difficulty of excavating rock slides.

Dmitriyev (1991) described the distribution of burrows in a colony of *O. daurica*. The largest burrow system had three nest chambers and 42 nest entrances within an area of 3.8×2.8 m (calculated from Dmitriyev's [1991] Fig. 1). In both Zevegmid (1975) and Dmitriyev's (1991) colonies, burrows were 5 cm in diameter, whereas they were 5–7 cm in this study. The diameter of the nest chambers was 27.6±2.5 (*SE*) cm (range=22–36, $n=5$, calculated from Dmitriyev's [1991] Fig. 1), which was similar to the 22 cm of this study, although Zevegmid (1975) found them to be much smaller at 11–12 cm. Dmitriyev's (1991) burrow system, extending 22–30 cm below the surface, was very similar in depth to ours (20–21 cm ; this study), whereas Zevegmid's (1975) burrow system was, at 11–12 cm, much shallower.

O. daurica typically accumulates large amounts of hay at its nest entrances for winter food (Loukashkin 1940, Ognev 1940, Zevegmid 1975, Orr 1977, Dlamtcheren *et al.* 1989). By mid-July, however, when we excavated the nest, there were no signs of plant material accumulations around the nest entrances. We were, however, able to describe, for the first time, the existence of food chambers underground in this species, though this is by no means unique to the genus, as Puget (1971) has described a similar burrow structure with food chambers underground and accumulated hay piles at nest entrances for *O. rufescens*. Although the food storing capacity of *O. daurica's* chambers does not seem to be great enough for the length of the winter in this region, the large amount of feces in the chambers suggests that they carried hay from the nest entrances into these chambers where they fed on it.

It is considered that the complex burrow system serves important functions. Pikas are often active above ground, thus having many nest entrances provided ready access to refuge from predators such as snowy owls, *Nyctea scandiaca*, corsac foxes, *Vulpes corsac*, wolves, *Canis lupus*, and particularly upland buzzards, *Buteo hemilasius* (Ognev 1940). Conversely, pikas underground are able to flee to the surface, escaping from ground predators such as

the stoat, *Mustela erminea*, which penetrates their burrow systems, by using one of the many burrows. Dmitriyev (1991) found each of six nest chambers to be connected to the surface by 2-3 burrows, as did we, and Simirnov (1974) found that *O. pallasi* chambers were similarly connected to the surface by three burrows and *O. pusilla* chambers by five burrows. These facts indicate that multiple burrows also provide refuge against the intrusion of predators into nest chambers.

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